

Fig. 1

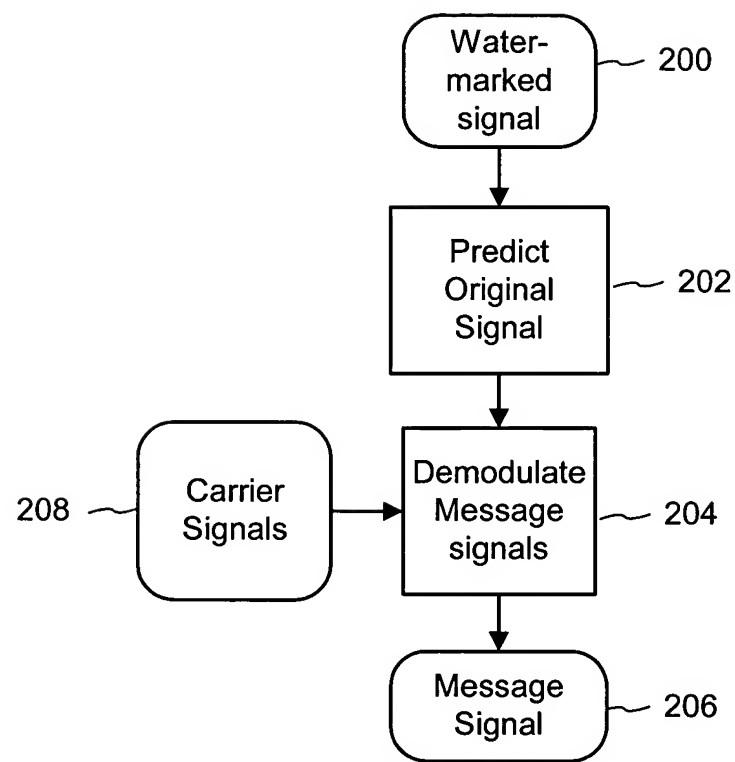
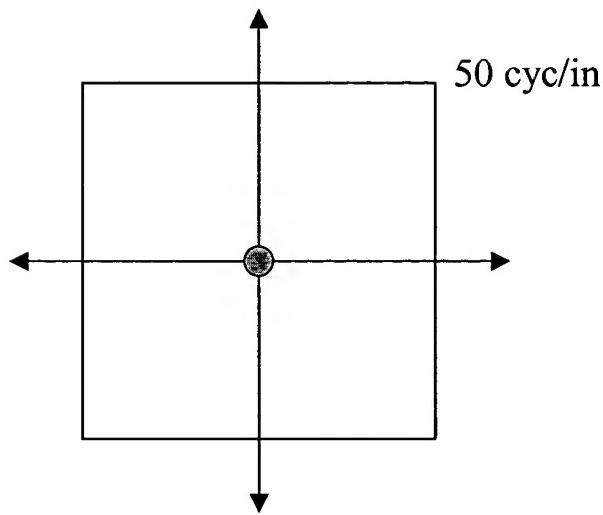
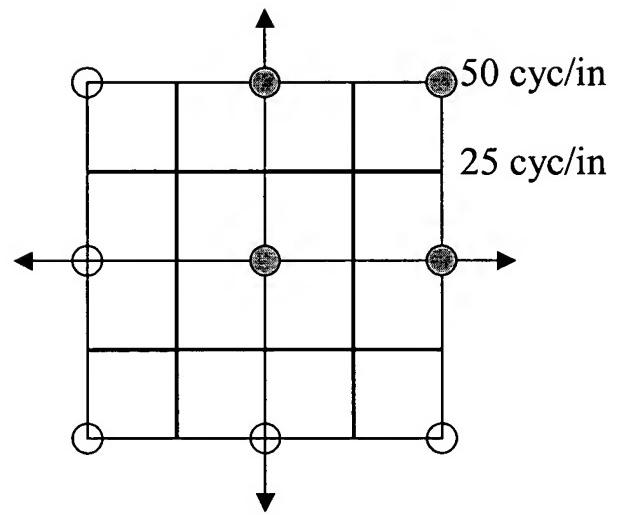


Fig. 2

Fig. 3



Single Carrier: Baseband



4 Carriers

Fig. 4

1/2	1/2
1/2	1/2

Carrier_{0,0}

1/2	-1/2
1/2	-1/2

Carrier_{1,0}

1/2	-1/2
-1/2	1/2

Carrier_{1,1}

1/2	1/2
-1/2	-1/2

Carrier_{0,1}

$$C_{0,0} = 1/2$$

$$C_{1,0} = 1/2 \cos(\omega_{50\text{cyc/in}} x)$$

$$C_{1,1} = 1/2 \cos(\omega_{50\text{cyc/in}} x) \\ \cos(\omega_{50\text{cyc/in}} y)$$

$$C_{0,1} = 1/2 \cos(\omega_{50\text{cyc/in}} y)$$

$$\text{Waveform} = f_0 C_{0,0} + f_1 C_{1,0} + f_2 C_{1,1} + f_3 C_{0,1}$$

| $f_3 f_2 f_1 f_0$ |
|-------------------|-------------------|-------------------|-------------------|-----------------------|
| -1 -1 -1 -1 | -2 0
0 0 | -1 1 -1 -1 | -1 -1 -1 -1 | -1 -1 -1 -1 |
| -1 -1 -1 1 | -1 1
1 1 | -1 1 -1 1 | 0 0
0 2 | 1 -1 -1 1
0 0 |
| -1 -1 1 -1 | -1 -1
1 -1 | -1 1 1 -1 | 0 -2
0 0 | 1 -1 1 -1
0 -2 |
| -1 -1 1 1 | 0 0
2 0 | 1 -1 1 1 | 0 0
0 -2 | 1 1 1 -1
1 1 -1 -1 |
| -1 -1 1 1 | 1 -1
1 1 | 1 -1 1 1 | 1 -1 1 -1
0 -2 | 1 1 1 1
1 -1 |
| -1 -1 1 1 | 1 -1
1 1 | 1 -1 1 1 | 1 -1 1 1
1 1 | 2 0
0 0 |

Fig. 5

Fig. 6

$f_3 f_2 f_1 f_0$	$f_3 f_2 f_1 f_0$	$f_3 f_2 f_1 f_0$	$f_3 f_2 f_1 f_0$
-1 -1 -1 -1	$\begin{array}{ c c } \hline -1 & -1 \\ \hline -1 & 1 \\ \hline \end{array}$	1 -1 -1 -1	$\begin{array}{ c c } \hline -1 & 1 \\ \hline -1 & -1 \\ \hline \end{array}$
-1 -1 -1 1	$\begin{array}{ c c } \hline -1 & 1 \\ \hline 1 & 1 \\ \hline \end{array}$	1 1 -1 1	$\begin{array}{ c c } \hline 1 & 1 \\ \hline -1 & 1 \\ \hline \end{array}$
-1 -1 1 -1	$\begin{array}{ c c } \hline -1 & -1 \\ \hline 1 & -1 \\ \hline \end{array}$	1 1 1 -1	$\begin{array}{ c c } \hline 1 & -1 \\ \hline -1 & -1 \\ \hline \end{array}$
-1 1 1 1	$\begin{array}{ c c } \hline 1 & -1 \\ \hline 1 & 1 \\ \hline \end{array}$	1 -1 1 1	$\begin{array}{ c c } \hline 1 & 1 \\ \hline 1 & -1 \\ \hline \end{array}$

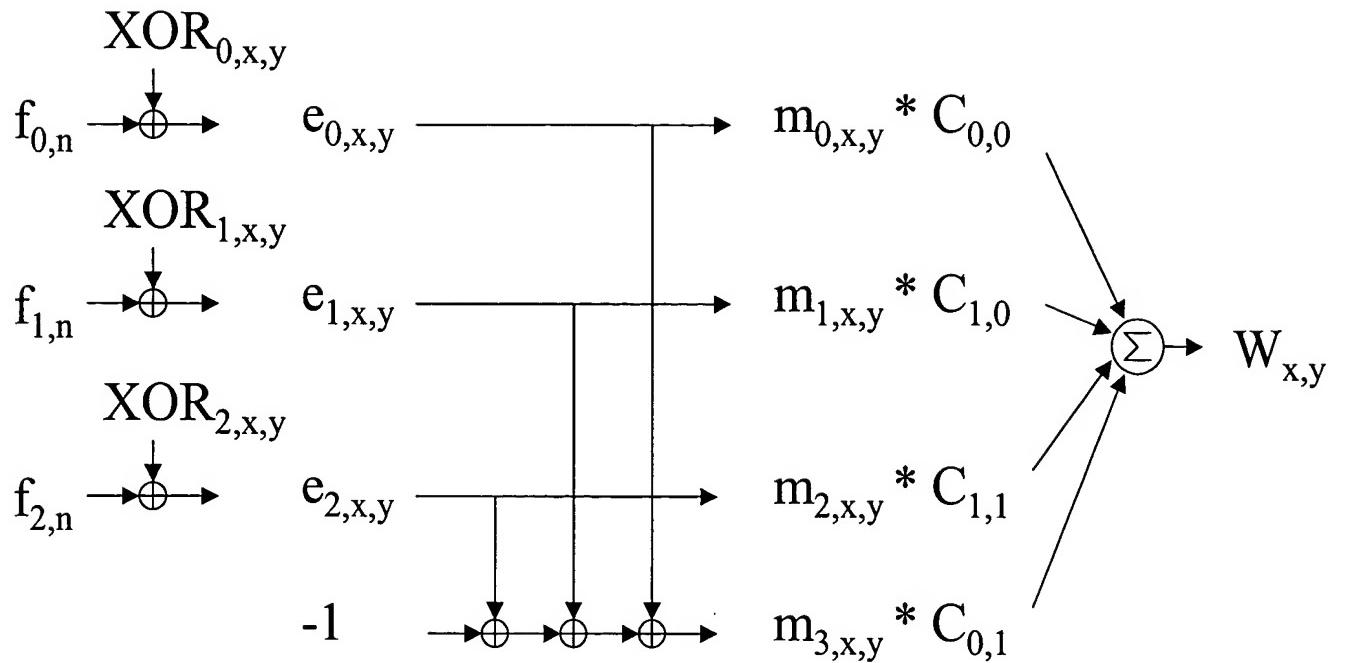


Fig. 7

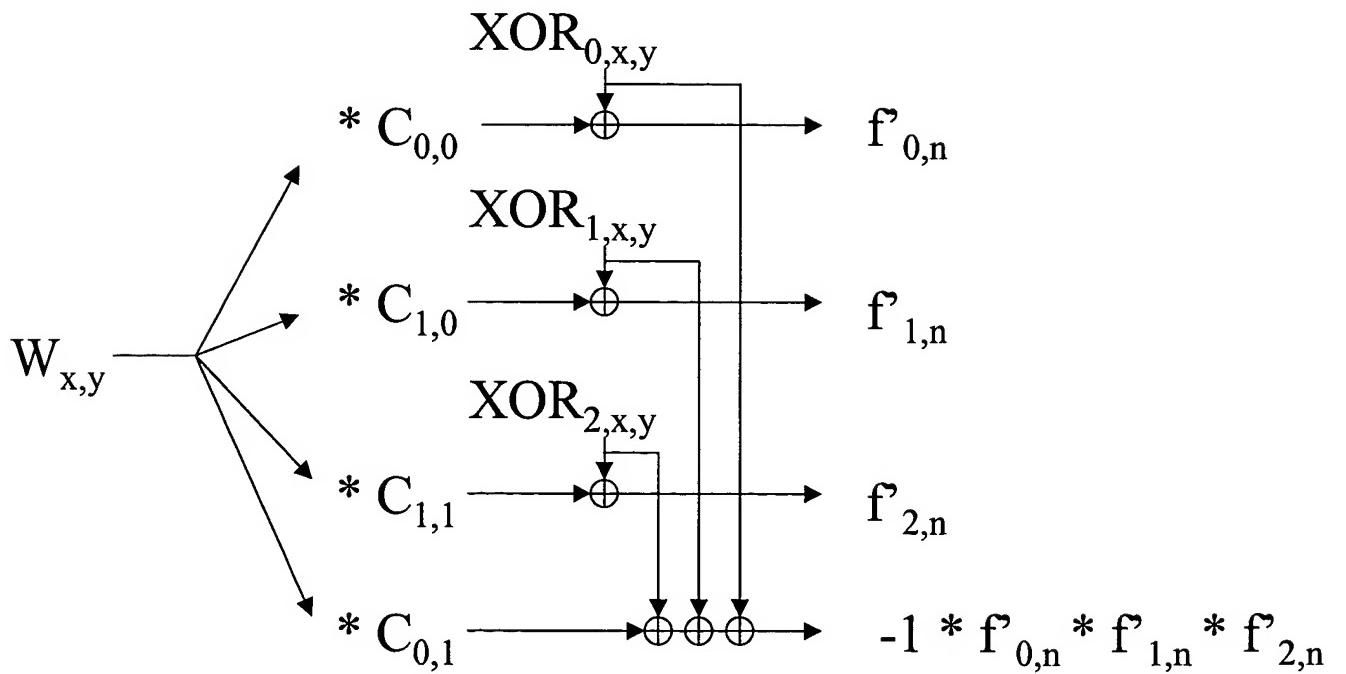


Fig. 8

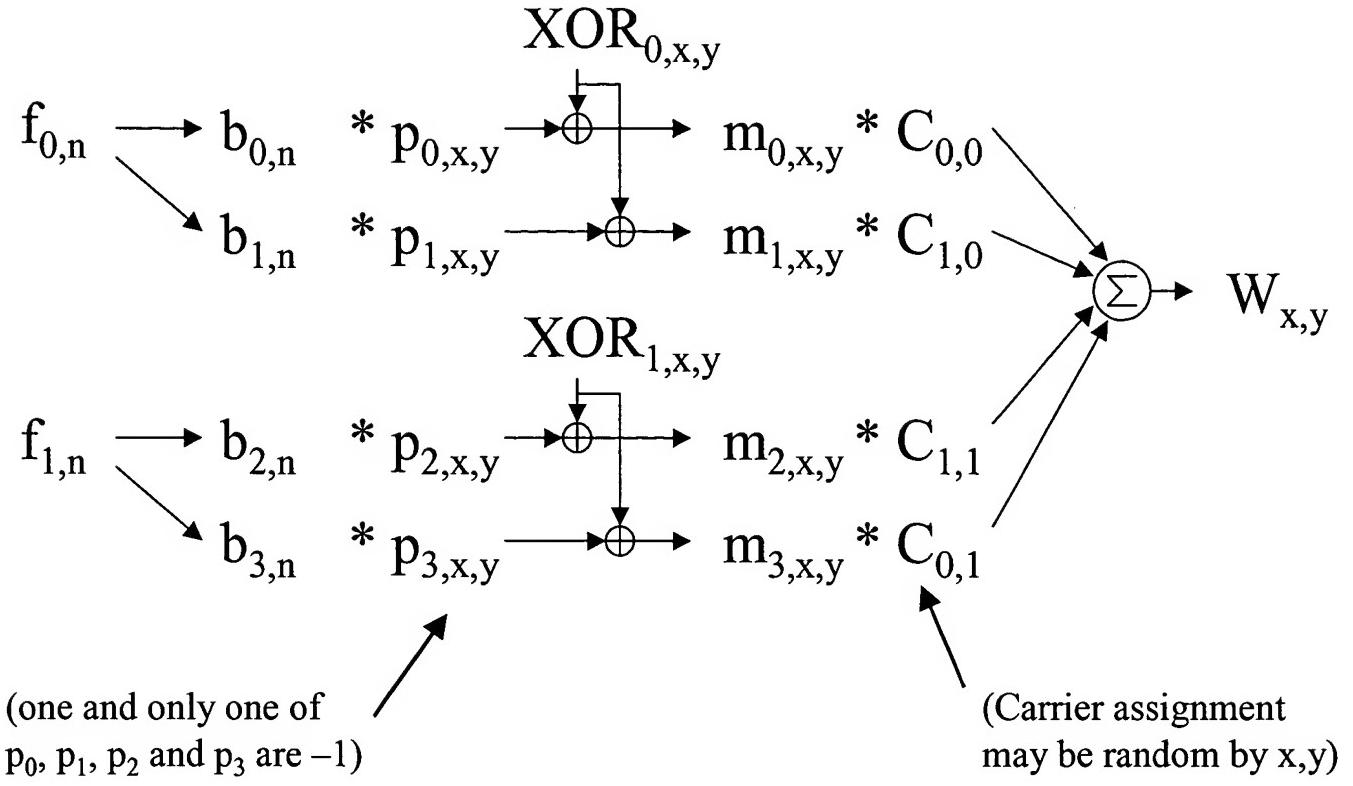


Fig. 9

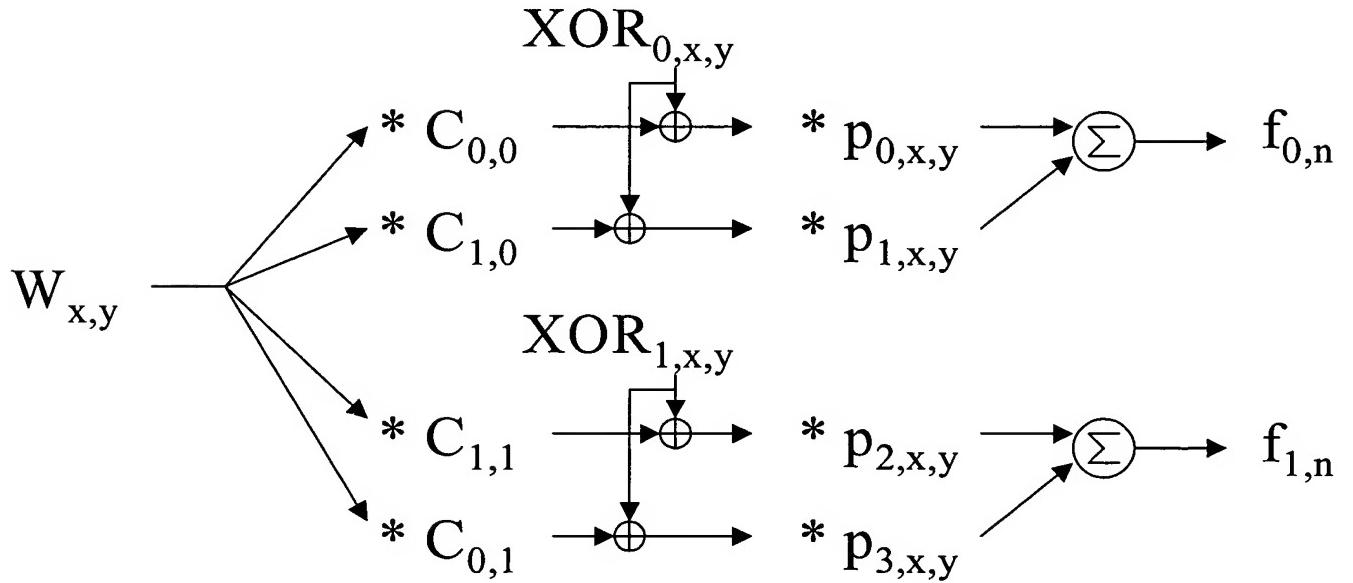


Fig. 10

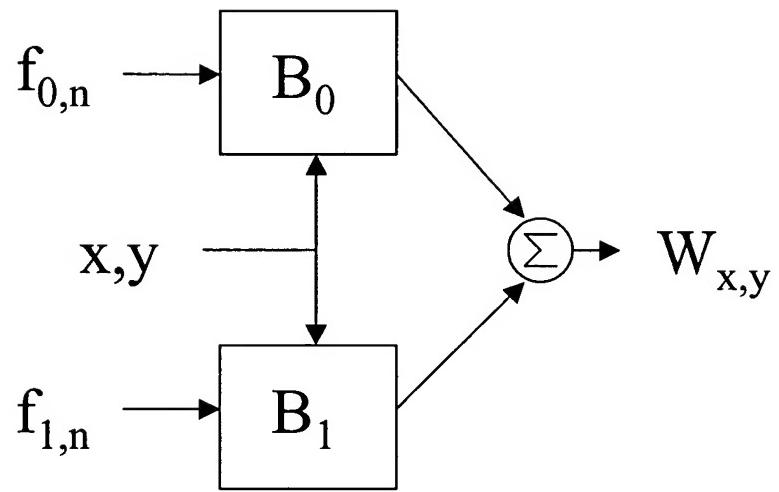


Fig. 11

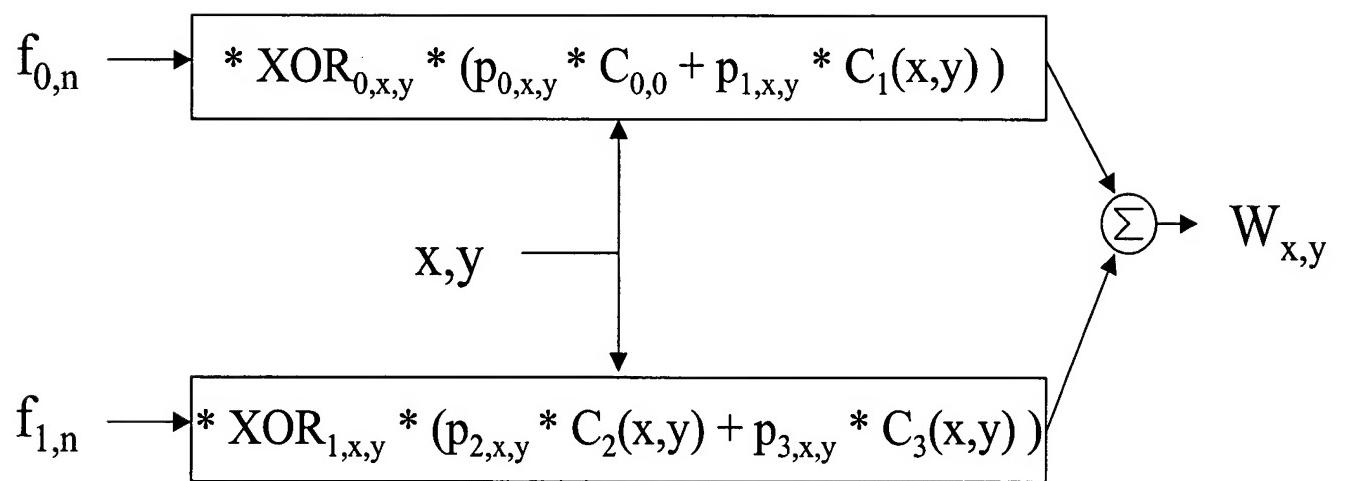


Fig. 12

Fig. 13

$$\begin{array}{l}
 (p_{0,x,y} * C_{0,0} + p_{1,x,y} * C_{1(x,y)}) \\
 (p_{2,x,y} * C_2(x,y) + p_{3,x,y} * C_3(x,y))
 \end{array}$$

$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$
$C_{1,0} C_{0,1}$	$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$	$C_{1,0} C_{0,1}$	$\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$
$C_{0,0} C_{0,1}$	$\begin{bmatrix} 0 & 0 \\ -1 & -1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
$-C_{0,0} C_{1,0}$	$\begin{bmatrix} 0 & 1 \\ 0 & -1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$
$-C_{0,0} C_{0,1}$	$\begin{bmatrix} 0 & -1 \\ 0 & 1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$
$-C_{0,0} C_{1,0}$	$\begin{bmatrix} 0 & 1 \\ 0 & -1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$
$C_{0,0} -C_{1,1}$	$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
$C_{0,0} -C_{0,1}$	$\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$
$C_{0,0} -C_{1,0}$	$\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$	$C_{0,0} C_{1,1}$	$\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$